National Institute of Environmental Health Sciences

Climate change and West Nile virus in a highly endemic region of North America

Author(s): Chen CC, Jenkins E, Epp T, Waldner C, Curry PS, Soos C
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Abstract:

The Canadian prairie provinces of Manitoba, Saskatchewan, and Alberta have reported the highest human incidence of clinical cases of West Nile virus (WNV) infection in Canada. The primary vector for WVN in this region is the mosquito Culex tarsalis. This study used constructed models and biological thresholds to predict the spatial and temporal distribution of Cx. tarsalis and WNV infection rate in the prairie provinces under a range of potential future climate and habitat conditions. We selected one median and two extreme outcome scenarios to represent future climate conditions in the 2020 (2010-2039), 2050 (2040-2069) and 2080 (2070-2099) time slices. In currently endemic regions, the projected WNV infection rate under the median outcome scenario in 2050 raised 17.91 times (ranged from 1.29-27.45 times for all scenarios and time slices) comparing to current climate conditions. Seasonal availability of Cx. tarsalis infected with WNV extended from June to August to include May and September. Moreover, our models predicted northward range expansion for Cx. tarsalis (1.06-2.56 times the current geographic area) and WNV (1.08-2.34 times the current geographic area). These findings predict future public and animal health risk of WNV in the Canadian prairie provinces.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: GMCs;SRA2;SRA1B;SRB1

Exposure :

weather or climate related pathway by which climate change affects health

Precipitation, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : Prairie;grassland

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Non-U.S. North America

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: West Nile Virus

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation, Mitigation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content